

# Surgical Treatment of Retrograde Peristalsis Following Laparoscopic Roux-en-Y Gastric Bypass

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## ABSTRACT

**Background:** Retrograde Roux limb peristalsis following laparoscopic Roux-en-Y gastric bypass is a rare complication that can be difficult to identify. It may present as persistent nausea, vomiting, abdominal pain, or even gastrointestinal bleeding related to an anastomotic ulcer. Upper gastrointestinal (UGI) series is an important diagnostic modality to identify this motility disorder; however, it may not be readily identifiable without specific delayed imaging. The etiology of this phenomenon is unclear, but attributing factors include the presence of ectopic pacemaker cells, variable lengths of the Roux limb and mis-constructions. When this problem is identified, revisional surgery is indicated.

**Case Description:** A 51-y-old female with morbid obesity presented with persistent nausea and vomiting following a laparoscopic gastric bypass. A CT scan showed a dilated Roux limb. Reverse peristalsis from the jejunojejunostomy toward the gastric pouch was identified on a UGI. Two laparoscopic revisions of the jejunojejunostomy were attempted to correct this dysfunction.

**Discussion:** An attempt at widening and relaxing the anastomosis was unsuccessful at providing relief of symptoms. A second revision with an anastomosis between the Roux limb and common channel provided long-term improvement. Identifying complications of gastric bypass surgery can be challenging. Imaging studies may be limited, and often diagnostic and revisional surgery is indicated.

**Key Words:** Reverse peristalsis, Gastric bypass, Obstruction, Jejunojejunostomy.

## INTRODUCTION

Because obesity is on the rise, the number of weight loss surgeries performed has increased exponentially over the past 10 y. Postoperative bariatric patients pose unique challenges to surgeons. Nonspecific GI complaints following gastric bypass surgery are very common, and the altered anatomy makes diagnostic testing difficult to perform or interpret. Imaging of the jejunojejunostomy, which can often be quite far downstream, can be limited. A final obstacle can be interpretation of the diagnostic tests by a radiologist familiar with the anatomy and typical variations of a gastric bypass. Persistent symptoms, malnutrition, and nondiagnostic testing may necessitate exploratory surgery.

## CASE REPORT

A 51-y-old female with a history of multiple joint problems and sleep apnea underwent an uncomplicated laparoscopic gastric bypass in 2009 for morbid obesity. Shortly thereafter, she began experiencing symptoms of persistent nausea, vomiting, and abdominal pain. Initial upper gastrointestinal (UGI) and CT scans did not show evidence of pathology. Symptoms continued and an esophagogastroduodenoscopy (EGD) was performed. This revealed an anastomotic ulcer; however, despite treatment the patient's symptoms persisted. At 3 mo postoperatively, a repeat CT scan of the abdomen and pelvis showed evidence of a mildly dilated Roux limb. A subsequent UGI demonstrated evidence of reverse peristalsis from the jejunojejunostomy toward the gastric pouch. Contrast did pass beyond the anastomotic site into the common channel. These findings raised concern for a partial obstruction at the jejunojejunostomy, and at this point the decision was made to take the patient to the operating room for laparoscopic exploration.

Minimal adhesiolysis was required to visualize the jejunojejunostomy, Roux limb, and gastrojejunostomy sites. The Roux limb appeared deflated and somewhat larger in diameter. The mesenteric attachment of the Roux limb was carefully inspected, and some of the mesentery divided to allow for a more relaxed position. The jejunojejunostomy was inspected thoroughly, and it was thought

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that there may be some kinking of the Roux limb. Anastomotic revision was achieved by firing an Endo-GIA stapler placed through an enterotomy made at the level of the staple line into the afferent and efferent segments, thus widening the anastomosis. The remaining enterotomy was closed using the Endo-GIA stapling device. The Roux limb was then pexied up to the gastric remnant to further relax the anastomosis. Reverse peristalsis was not redemonstrated on postoperative UGI, and the patient's symptoms initially improved.

Within a month of revision, the patient's symptoms returned and continued to escalate. The patient had lost a fair amount of weight with evidence of malnutrition. UGI again showed reverse peristaltic contractions. Consultation was obtained with another bariatric surgeon for further insight on correcting the underlying dysfunction. Symptomatology was thought likely secondary to ongoing obstruction at the jejunojejunostomy, and laparoscopic re-exploration with revision of this anastomosis going towards the common channel was planned.

On re-exploration, extensive adhesiolysis was required to visualize the jejunojejunostomy. The Roux limb remained significantly dilated from the jejunojejunostomy up to the gastric pouch. The common channel appeared decompressed. The jejunojejunostomy was revised by creating an anastomosis between the Roux limb and the common channel with a linear stapler placed through enterotomies made in each limb. The remaining enterotomy was closed with a running stitch of 0-vicryl. The patient remained symptom free after the second revisional operation.

## DISCUSSION

Reverse peristalsis is a rare complication of Roux-en-Y reconstruction seen with biliary and GI diversion procedures. Its presence may indicate improper length of the Roux limb, angulation, kink or narrowing of the jejunojejunostomy causing obstruction.

Reverse peristalsis can also be observed with Roux and Y misconstructions performed during gastric bypass surgery.<sup>1-3</sup> These include the "Roux en O" construction, in which the biliary limb is connected to the gastric pouch or a reversed free alimentary segment, which may be seen more with revision surgery rather than primary construction. The incidence of these misconstructions is rare.

A small number of cases involving reverse peristalsis following Roux-en-Y gastric bypass without obvious misconstructions have been documented in the literature.<sup>4</sup> Two

additional reports have been published documenting a reverse peristaltic Roux limb following total gastrectomy and biliary enteric bypass after bile duct injury.<sup>5,6</sup>

When constructing the Roux limb, the jejunum is divided at varying lengths (typically 10cm to 30cm), depending on the type of procedure being performed. The length of the Roux limb itself is also variable usually in the range of 40cm to 60cm following gastrectomy and biliary bypass procedures with longer lengths of 60cm to 150cm utilized for gastric bypass surgery. Longer Roux limbs have been associated with greater weight loss and utilized in patients with higher BMIs.<sup>7</sup>

The inherent pacemaker cells of the small intestines are found in the duodenum. Ectopic pacemaker cells can be found throughout the jejunum and ileum. These ectopic pacemaker cells generate slower potentials that drive contractions in the Roux limb in the orad direction.<sup>8</sup> Roux limbs of 35cm to 40cm have been shown to be effective at preventing reflux gastritis, ulceration, and delayed gastric emptying after Roux-en-Y construction. Roux limbs >40cm are associated with greater disruption of the normal antegrade contractile pattern.<sup>9</sup> The optimal jejunal transection point and Roux limb length to prevent retrograde peristaltic activity have not been established.

Symptoms present in the immediate postoperative period are very nonspecific and can be indistinguishable from symptoms associated with other complications. This phenomenon also poses a challenge to identification by imaging, especially pertaining to the morbidly obese patient.<sup>1</sup> Not only are there weight limitations posed by different radiologic modalities, but also technical modifications and adjustment to standard protocols need to be made for sufficient imaging to be obtained. Interpreting radiologists also need to be familiar with the altered anatomy and the associated complications of the procedure.

Initial imaging may be unremarkable. CT scan may show dilation of the Roux limb and raise the concern for a mechanical or possibly functional obstruction. Fluoroscopic imaging is a key component to diagnosis of motility disorders. The Roux limb may appear dilated, and initially contrast may pass unremarkably into the common channel. A larger amount of contrast may need to be administered to increase the luminal volume enough to trigger the retrograde peristaltic activity.<sup>1</sup> Retrograde peristaltic activity is a transient phenomenon, with antegrade peristaltic activity restored once the Roux limb has decompressed itself. Generally, static fluoroscopic images appear unremarkable, so it is imperative that the radiologist spends sufficient time assessing the motility of the Roux

limb in its entirety from the gastrojejunal to jejunojejunal anastomosis. Intestinal manometry has also been utilized to aid in the identification of reverse peristaltic activity following total gastrectomy; however, this is not readily available at most institutions.

The incidence of mechanical obstruction is approximately 2% to 3% following both open and laparoscopic gastric bypass.<sup>10</sup> The level of obstruction is commonly at the jejunojejunal anastomosis leading to dilation of the Roux limb, biliopancreatic limb, or both.<sup>11</sup> Because static imaging is unable to distinguish between functional and most causes of mechanical obstruction, forms of mechanical obstruction need to be ruled out. Causes of early mechanical obstruction include narrowing of the jejunojejunostomy anastomosis, angulation of the Roux limb, and obstruction of the Roux limb at the level of the transverse mesocolon.<sup>10–12</sup> The presence of early obstruction is commonly attributed to errors in operative technique. The mean time to presentation of early obstruction is approximately 15 d. Common causes of late obstruction are internal hernias, adhesions, or herniation of small bowel through defects in the abdominal wall with the mean time interval for development being 7 mo.

Conservative management of presumed mechanical obstruction has been attempted with some success. However, because of the complexity and multitude of causes not easily distinguishable by radiologic imaging, operative exploration is often pursued. Direct operative visualization can also be utilized to diagnose functional obstruction, because reversed peristaltic waves can be directly observed as reported by Schrope et al.<sup>4</sup>

Surgical management of retrograde peristalsis requires correction of misconstructions, revision of the jejunojejunal anastomosis, or reversal of the gastric bypass. The Roux limb can be shortened or lengthened to reposition dominant ectopic pacemaker cells. Widening the jejunojejunostomy by making an enterotomy at the level of this anastomosis and firing a linear stapler through the afferent and efferent limbs may disrupt the area generating the disruptive migrating motor complexes and can correct any contributing mechanical component from narrowing or angulation. Another option is the creation of a proximal enteroenterostomy between the Roux limb and common channel, which acts as a separate outlet to bypass both functional and mechanical causes of obstruction. Construction of an “uncut” Roux-en-Y has been utilized following subtotal gastrectomy for adenocarcinoma, gastroparesis, peptic ulceration with gastric outlet obstruction, and bile reflux gastritis to avoid the effects of ectopic

pacemaker cells generated by disruption of bowel continuity seen with Roux-en-Y construction.<sup>13</sup> Its construction consists of a modified Billroth II gastrojejunostomy in which staples occlude the afferent jejunal lumen, while biliary and pancreatic secretions are diverted distally through a jejunojejunostomy. Creation of a “rho” shaped Roux-en-Y gastrojejunostomy after distal gastrectomy for gastric cancer has also been described to overcome the influence of ectopic pacemaker cells.<sup>14</sup> The theory behind this construction is that delayed emptying will be prevented by allowing bidirectional flow generated by ectopic pacemaker cells in the rho-shaped intestine. These alternate constructions have not been utilized for weight loss surgery.

## CONCLUSION

Reverse peristaltic activity is a rare complication associated with Roux and Y construction. Symptoms may be nonspecific, and the timing to presentation can be variable. It can be recognized by CT scan or by UGI with delayed imaging. This phenomenon leads to functional obstruction of the Roux limb necessitating revisional surgery for relief of symptoms and prevention of malnutrition. With the increased performance of bariatric procedures, bariatric surgeons are likely to see this complication more frequently and should include this in their differential diagnosis when managing complicated postoperative patients.

## References:

1. Mitchell MT. Bariatric imaging: Technical aspects and postoperative complications. *Appl Radiol*. 2008;37:10–22.
2. Mitchell MT, Gasparaitis AE, Alverdy JC. Imaging findings in Roux-en-O and other misconstructions: rare but serious complications of Roux-en-Y gastric bypass surgery. *Am J Roentgenol*. 2008;190:367–373.
3. Nelson LG, Sarr MG, Murr MM. Errant and unrecognized antiperistaltic Roux limb construction during Roux-en-Y gastric bypass for clinically significant obesity. *Surg Obes Relat Dis*. 2006;2:523–527.
4. Schrope BA, Daud A, Bessler M. Unintentional creation of reverse peristaltic alimentary limb during Roux-en-Y gastric bypass surgery. *Surg Obes Relat Dis*. 2006;2:478–482.
5. DiBaise JK, Iyer K, Thompson JS. Identification and management of an errant antiperistaltic Roux limb after total gastrectomy. *J Gastrointest Surg*. 2005;9:726–732.
6. Zorn 3rd GL, Wright JK, Pinson CW, Debelak JP, Chapman WC. Antiperistaltic Roux-en-Y biliary-enteric bypass after bile

duct injury: a technical error in reconstruction. *Am Surg*. 1999; 65:581–585.

7. Inabnet W, Quinn T, Gagner M, Urban M, Pomp A. Laparoscopic Roux-en-Y gastric bypass in patients with BMI <50: a prospective randomized trial comparing short and long limb lengths. *Obes Surg*. 2005;15:51–57.

8. Mathias JR, Fernandez A, Sninsky CA, Clench MH, Davis RH. Nausea, vomiting, and abdominal pain after Roux-en-Y anastomosis: motility of the jejunal limb. *Gastroenterology*. 1985;88: 101–107.

9. Dutra RA, Araújo WM, Andrade JI. The effects of Roux-en-Y limb length on gastric emptying and enterogastric reflux in rats. *Acta Cirurgica Brasileira*. 2008;23:179–183.

10. Nguyen N, Huerta S, Gelfand D, Stevens C, Jim J. Bowel obstruction after laparoscopic Roux-en-Y gastric bypass. *Obes Surg*. 2004;14:190–196.

11. Gunabushanam G, Shankar S, Czemiach DR, Kelly JJ, Perugini RA. Small-bowel obstruction after laparoscopic Roux-en-Y gastric bypass surgery. *J Comput Assist Tomogr*. 2009;33:369–375.

12. Felsher J, Brodsky J, Brody F. Small bowel obstruction after laparoscopic Roux-en-Y gastric bypass. *Surgery*. 2003;134:501–505.

13. Mon RA, Cullen JJ. Standard Roux-en-Y gastrojejunostomy vs. “uncut” Roux-en-Y gastrojejunostomy: a matched cohort study. *J Gastrointest Surg*. 2000;4:298–303.

14. Hirao M, Kurokawa Y, Fujitani K, Tsujinaka T. Randomized controlled trial of Roux-en-Y versus Rho-shaped-Roux-en-Y reconstruction after distal gastrectomy for gastric cancer. *World J Surg*. 2009;33:290–295.